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(54) Method and apparatus for manufacturing sheet or plate shaped objects of fibrous web material, in particular needed fibrous web and object manufactured by applying the method.

(57) Method and apparatus for manufacturing sheet or plate shaped objects of fibrous web material, wherewith a web is woven out of a plurality of longitudinal (1a,1b) and tranverse strips (2), whereafter edge strips (7,9) may be applied as well as end strips (8), which also may be applied after the web is cut into smaller objects. A further finishing may consist of a synthetic framing (10,11) or embroideries such as bordered festoons or overedgings (32).

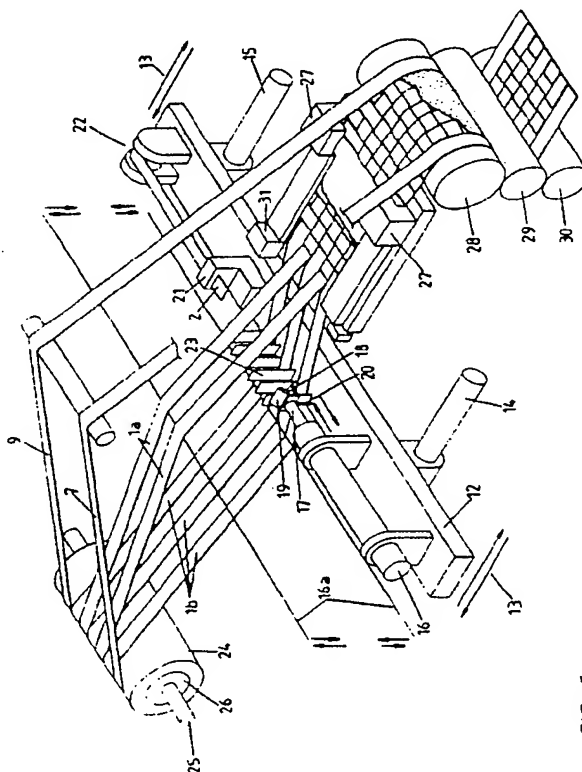


FIG. 5

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Method and apparatus for manufacturing sheet or plate shaped objects of fibrous web material, in particular needled fibrous web and object manufactured by applying the method.

Fibrous web material and more in particular needled fibrous web material, for example of synthetic materials such as polypropylene, is increasingly applied.

Although it is possible to produce such a fibrous web material and even a needled fibrous web material in different colours, it remains difficult to make patterns and in particular patterns with sharp boundaries in such a material. Especially needled fibrous web material, when coloured afterwards, gives an insufficient sharp boundary between areas of different colours.

Moreover it is preferred to apply the dye to the fibres before the fibrous web is finished, by which without any trouble colours and even washable colours can be obtained.

A further restriction in the use of fibrous web material is lying in the fact that, when a relatively large thickness is required, the whole becomes very stiff, which is very troublesome in many applications, for instance with staircarpets.

The invention aims to provide a method, by which fibrous web material and in particular also needled fibrous web material can be made into objects, which lack the above mentioned disadvantages, as well as an apparatus for applying the method and the objects obtained with it.

Accordingly it is provided by the invention, that a plurality of longitudinal strips is placed side by side in paths moving in their longitudinal direction, which paths are mutually parallel in a perpendicular view, the longitudinal strips are shifted alternately in the one or the other direction and/or in different measures perpendicular from their plane into a first position, that in the interspace formed therewith a transverse strip is placed transverse to the paths, whereafter each of the longitudinal strips is shifted in opposite direction and/or in different measures in a reversed manner into a second position, that in the then formed interspace a next transverse strip is placed and so on, the longitudinal strips, the transverse strips and/or both being of fibrous web material.

The matted material of fibrous web strips obtained in this manner has a greater flexibility than a sheet of fibrous web material with a double thickness of a strip and moreover all sorts of patterns, for example a chequered pattern, are possible.

It is remarked that material consisting of matted strips is known per se from for instance US-A-2 745 444 and GB-A-1 176 078.

In US-A-2 745 444 a matting of hollow tubular elements flattened into strips is shown and in GB-A-1 176 078 a number of parallel transverse strips

of extruded and softened plastic material is one-sidedly glued to a number of adjacent parallel longitudinal strips. The pattern and stiffness problems of needled fibrous material were not mentioned.

Because with the application of the invention the longitudinal strips and the transverse strips do not necessarily have to have the same width and because without objections it is possible to give the transverse strips successively different colours and/or widths, a very large number of different possibilities arises to make patterns.

Each transverse strip, after being placed into the interspace between the longitudinal strips, is moved toward the previously placed longitudinal strip. In this way a relatively closed mat is obtained.

To finish the longitudinal edges it is preferably provided that edge strips running parallel to the longitudinal strips are attached to the transverse strips. In this manner a simple and good finishing of the longitudinal edges of the manufactured web is possible, wherewith the width of the edge strip may differ from that of the longitudinal strips as well as their colours and even the one edge strip may have another colour and width as the other edge strip.

The edge strips are preferably also made of fibrous web material, but this is not absolutely necessary.

Another possible finishing of the longitudinal edges exists in that the outermost longitudinal strip forms the edge strip and that the transverse strips are attached alternately to the one and the other side of the edge strip.

A very good embodiment is obtained when the transverse strips protrude beyond the outermost longitudinal strip, where they are kept together by an edge strip.

Also it is possible to have the last transverse strip as an end strip, with the longitudinal strips attached alternately to the one and the other side of the end strip. This is a rather simple way of manufacturing, whereby the finishing of both cutting edges is obtained by welding the cut-off ends of the longitudinal strips to the outer edge of the concerning transverse strip, which is possible in a simple manner by using a heated cutting device, for example a metal wire, heated by the passage of an electric current.

It is also possible to have the longitudinal strips protrude beyond the last transverse strip and that at that place an end strip is attached thereto, for example by glueing.

For the cutting-off it may be advantageous to attach an end strip firstly and to cut the strip afterwards, directly adjacent but preferably at that location, for example in the middle of the end strip, so that both cut-off objects have a finished edge. A good finishing can also be obtained by means of a sewing or stitching operation. More specifically a bordered stitching operation is recommended, such as festooning or overedging.

This operation can be applied to an edge, whereto the strips which run transverse to this edge, are placed alternately to the different sides of the edge strip, as well as to an edge, where the strips running transversely to the edge, are always positioned to the same side of the strip.

The invention also provides an apparatus to apply the method. Such an apparatus is characterized by a feeding device for a plurality of mutually parallel longitudinal strips, having a braking or a tensioning device; a device to move alternating longitudinal strips in the one or the other direction and back again; a transverse strip feeding device to place transverse strips between the longitudinal strips and a cutting device for the transverse strip.

A weaving loom with a grab as used in the invention is known per se from GB-A-289 570.

One of the most important problems to be solved by the invention is the fastening of the cut-off ends of the transverse strips. This can be achieved mechanically by providing that a feeding device for edge strips is present and a device for attaching the edge strips to the ends of the transverse strips, which can be done by means of glueing.

Contrary to the method usually applied with weaving, namely pulling off the treads or bands parallel to the axis of the spool or shuttle, with the apparatus according to the invention the longitudinal, transverse, edge and end strips are pulled off perpendicular to the axis of the roll or spool, because with the first method the strips are twisted and remain straight with the second method. This is known per se from DE-A-2 615 046.

Further a lenght cutting device may be provided, which is adapted to cut off longitudinal strips directly adjacent to or at the end strip or the transverse strips whereto the longitudinal strips are attached. The cutting device may be provided with heatable cutting means, which also serves as welding device.

The invention also comprises a web-or sheet-shaped object, which is at least made partially of fibrous web material, which is characterized in that parallel longitudinal strips of fibrous web material are applied alternately under or on tranverse strips, directed transversely to the parallel longitudinal strips. Preferably the transverse strips are also made of fibrous web material.

It is also possible to use strips of another material between the parallel strips of fibrous web material, running parallel thereto. This can be useful to obtain certain esthetic or local mechanical qualities, but generally it will be disadvantageous to the homogeneity of the object.

Fibrous web material, in particular when needed, is light, somewhat elastical and relatively thick, which makes it too instance specially suitable for floor covering. Mats, carpets, stair carpets and permanent floor coverings can be manufactured in this manner. Therewith the invention gives the possibility to make patterns. With the previous described methods such web-or sheet-shaped objects may be finished at their edges with edge or end strips, festoons, fringes and/or overedging.

It is also possible to mount a preferably flexible frame to the circumference of such an object, which embraces the ends of the strips. Such a frame, for example made of a flexible synthetic material, may consist of one part or a number of parts, for example a flat frame upon which the object is placed and on that another frame, whereby the protruding parts of the frames are attached to each other. This embodiment of the invention is very suitable for example for door mats.

The strips may be attached to each other by means of glueing, in particular at the longitudinal edges. In technology glues are known, which join surfaces of needed fibrous web material rapidly and securely.

Another possibility is cutting with a heated cutting device, which at the same time has a welding function.

Objects according to the invention may have block patterns, whereby the inequality in width of the strips oblong blocks are possible and it is also possible that a number of adjacent blocks get the same colour, by which patterns are possible with a greater surface area than that of a single block. Further it is possible that the transverse strips have a direction not perpendicular to the longitudinal strips, but oblique thereto. By using longitudinal, transverse, edge and end strips of a number of different colours, for instance four or six, a large variety of attractive patterns are possible.

Finally it is not necessary that the objects are rectangular or rhomb shaped, but it is possible to cut off along any line, provided that along that line an edge finishing is applied.

The invention is elucidated in the following on hand of the drawing, in which:

figure 1 schematically shows a part of an object according to the invention during manufacturing thereof;

figure 2 shows the same object in a further manufacturing step;

figure 3 shows an object according to the invention with strips of unequal width, which are woven obliquely, provided with an edge framing;

figure 4 shows a cross-section along line IV-IV of fig. 3;

figure 4A shows a cross-section corresponding with the one of fig. 4, of a further embodiment; and

figure 5 shows schematically an apparatus for the manufacturing of objects according to the invention.

In fig. 1 a number of longitudinal strips, running in parallel paths, are indicated with 1. These longitudinal strips are made of needled fibrous web material, with fibers of for instance polypropene. Such a web has a thickness of for example 5 mm and in spite of the small specific weight it has a good coherence and a good resistance against wear, also because the fibers are felted very well by needling. Moreover such a strip can be coloured through-out, so that without difficulty a dye can be applied, which is stable and completely absorbed by the fibrous strip. This can already be done when manufacturing the web or the sheet, from which the strip has to be cut, whereby it is pointed out that it is not very well possible to colour a needled fibrous web within strict boundaries with a sufficient penetration of the dye to define the colour in a stable manner.

Transverse to the strips 1 transverse strips 2 are placed, which are lying alternately above or under strips 1, in which way a fabric is formed. The strips 2 protrude at the left side beyond the left strip 1 over a distance, which is for example equal to the width of a strip 1, but which can also be smaller or greater. At both sides the parts 3 and 4 of the strips 2 are present, which have alternately different lengths over which they are visible and which all protrude beyond strips 1.

As is shown in fig. 2 the parts of strips 2, which protrude beyond strips 1, are provided with edge strips 7 and 9 respectively. At the lower side in fig. 1 one strip 2 has not been mounted to make a finishing possible in the longitudinal direction of the mat, woven from strips 1 and 2. In this way successive protruding parts 5 and 6 are mounted, which protrude beyond the lowermost strip 2. An end strip 8 is placed on these protruding parts 5 and 6, which also overlies the ends of strips 7 and 9.

To make a cut off possible in the longitudinal direction, it is attractive to achieve a cut through the strip 8. This is shown schematically in fig. 2 with a broadening of strip 8 by means of strip section 8', which then forms the end strip of the preceding mat.

In fig. 3 and 4 an embodiment according to the invention is shown, which deviates in a number of respects from the one of fig. 1 and 2. In the first

place strips 2 are not applied perpendicular but oblique to strips 1. Further strips 2' have a greater width than strips 1. Also a frame is mounted, for example made of polyvinylchloride, which consists of a lower frame 11 and an upper frame 10 glued or welded thereto along the outer side.

It will be clear, that in order to obtain further variations in the appearance, strips 1 may have different widths or colours and it is also possible to give strips 2 different widths and/or colours. It is even possible to give the strips a different character, for example by providing strips 2 with an anti-slip layer, which is also possible for every  $n^{\text{th}}$  strip, whereby  $n$  is a whole number, which preferably has a low value, such as 2, 3, 4 or 5.

Because material with an anti-slip layer often has a greater stiffness than the same material without such a layer, the use of only a limited number of strips with such a layer gives a good combination of flexibility and good anti-slip properties.

The forming of an anti-slip layer or the application of other means, which increase the friction is known per se. In principle it is even possible to apply a process to a fabric according to the invention, which improves the anti-slip properties.

Fig. 4 shows a cross-section along line IV-IV of fig. 3. Therefrom it appears that a circumferential frame 11 is mounted at the bottomside of the mat and an also circumferential frame 10 at the top side of the mat, whereby frame 10 is attached to both the edge of the mat and the frame 11 by means of glueing or welding. The mat is lying between the frames 10, 11, whereby strip 8 is visible in cross-section, which overlies strips 1 and edge strips 7 and 9.

The embodiment of fig. 4 can be realized for example by lifting strip 8, which is glued to edge strips 7 and 9, and placing the above lying ends of strips 1 beneath the strip.

The embodiment, of which fig. 4A shows a cross-section through a transverse strip, can be brought about in a simple manner. A normal fabric with edge strips 7 and 9 is cut between successive strips 2 with a heated wire, which welds the side of strip 2 to strips 7 and 9. Later on such a connection is made permanent and finished with a festoon or overedging 32.

In the scheme of the apparatus according to the invention, which is shown in fig. 5, a beam 12 is movable to and fro in the direction of arrows 13 by means of a pneumatic device, not shown. The beam 12 is moving on guides 14 and 15.

On the beam 12 a pneumatic cylinder 16 is placed with a rod 17, which carries a grab, consisting of a fixed jaw 18 and a movable jaw 19, whereto a control finger 20 is connected. Opposite to the grab 18-20 a guide 21 for a strip 2 is

mounted, which is connected to a strip supply, not shown, by means of a guiding roll 22 or the like.

The strips 1a are moved upward and strips 1b downward. These strips move over guides 16a, which are movable up and down in such a way, that strips 1b may be placed in the position of strips 1a and vice versa. When the strips are placed in the shown position, the grab 18-20 can be moved between strips 1a and 1b to the supply guide 21, where the control finger 20 strikes against a not shown stop and closes the grab 18-20, whereafter the grab 18-20 can be moved back. Further beam 12 is moved to the right, whereby the prongs of the fork 23, which protrude between strips 1a and 1b, carry the strip 2 sideways with them and bring it to the location where strips 1a and 1b join again. At that location strip 2 is cut off by a cutting device 31. Beyond cutting device 31 a device 27 for applying glue is present, which provides the protruding parts of strip 2 with glue.

The strips 1a and 1b are pulled off from a roll 24, which is rotatable around an axis 25 and whereto a brake can be applied by means of the schematically shown braking device 26. Outside of strips 1 an edge strip 7 is located at the one side and an edge strip 9 at the other side, which cannot be moved up and down and are moved separately to the protruding parts of strips 2 and onto these parts, whereafter a roll 28 provided with nails moves forcedly strips 1a, 1b and strips 2 along. The strips 7 and 9 are carried along, because they are clamped between roll 28 and roll 29. Between roll 29 and roll 30 then protrudes a woven mat provided with glued edge strips.

Such a mat can be cut into pieces and undergo a finishing, as already discussed in connection with figs. 4 and 4A. The cutting-off can be done at the end of the shown apparatus, but it is also possible to make a long woven web, which afterwards is cut in objects of different or equal length. The cutting-off in combination with the welding together and the eventually festooning or overedging afterwards, discussed in connection with fig. 4A, can also be applied to cuttings in the longitudinal direction, by which it is possible to make smaller objects out of a broad woven web.

Although edge strips 7 and 9 are used in the depicted embodiments, this is not always necessary.

## Claims

1. Method for manufacturing web-or sheet-shaped objects of fibrous web material, in particular of needled fibrous web material, in which oblong strips of fibrous web material are joined to a whole, characterized in that a plurality of longitudinal strips

(1a, 1b) is placed side by side in paths moving in their longitudinal direction, which paths are mutually parallel in a perpendicular view, the longitudinal strips (1a, 1b) are shifted alternately in the one or the other direction and/or in different measures perpendicular from their plane into a first position, that in the interspace formed therewith a transverse strip (2) is placed transverse to the paths, whereafter each of the longitudinal strips (1a, 1b) is shifted in opposite direction and/or in different measures in a reversed manner into a second position, that in the then formed interspace a next transverse strip (2) is placed and so on, the longitudinal strips (1a, 1b), the transverse strips (2) and/or both being of fibrous web material.

2. Method according to claim 1, characterized in that edge strips (7, 9) running parallel to the longitudinal strips (1a, 1b) are attached to the transverse strips.

3. Method according to claim 1 or 2, characterized in that the longitudinal strips (1a, 1b) are attached to an end strip (8) running in the direction of the transverse strips (2) and are cut through directly adjacent to or at the end strip (8).

4. Apparatus to apply the method according to one or more of the claims 1-3, characterized by a feeding device (24) for a plurality of mutually parallel longitudinal strips (1a, 1b), having a braking or a tensioning device (26); a device (16a) to move alternating longitudinal strips (1a, 1b) in the one or the other direction and back again; a transverse strip feeding device to place transverse strips (2) between the longitudinal strips (1a, 1b) and a cutting device (31) for the transverse strip (2).

5. Apparatus according to claim 4, characterized in that a feeding device (24) for edge strips (7, 9) is provided and a device for attaching the edge strips (7, 9) to the ends of the transverse strips (2).

6. Apparatus according to claim 4 or 5, characterized in that a device is provided for applying an end strip (8) parallel to the transverse strips (2) and to attach the end strip (8) to the longitudinal strips (1a, 1b).

7. Web-or sheet-shaped object, made at least partially from fibrous web material, characterized in that parallel longitudinal strips (1a, 1b) of fibrous web material are applied alternately under or on transverse strips (2), directed transversely to the parallel longitudinal strips (1a, 1b).

8. Object according to claim 7, characterized in that the ends of the transverse strips (2) are attached to edge strips (7, 9), which run parallel to the longitudinal strips (1a, 1b).

9. Sheet-shaped object according to claim 7 or 8, characterized in that the longitudinal strips (1a, 1b) are cut off at or near a transverse strip (2) and attached to said transverse strip (2).

10. Object according to one or more of claims 7-9, characterized in that at least some of the edges are finished with an embroidery such as a bordered festoon or overedging.

11. Object according to one or more of claims 7-10, characterized in that along the circumference a preferably flexible frame is provided for embracing the ends of the strips.

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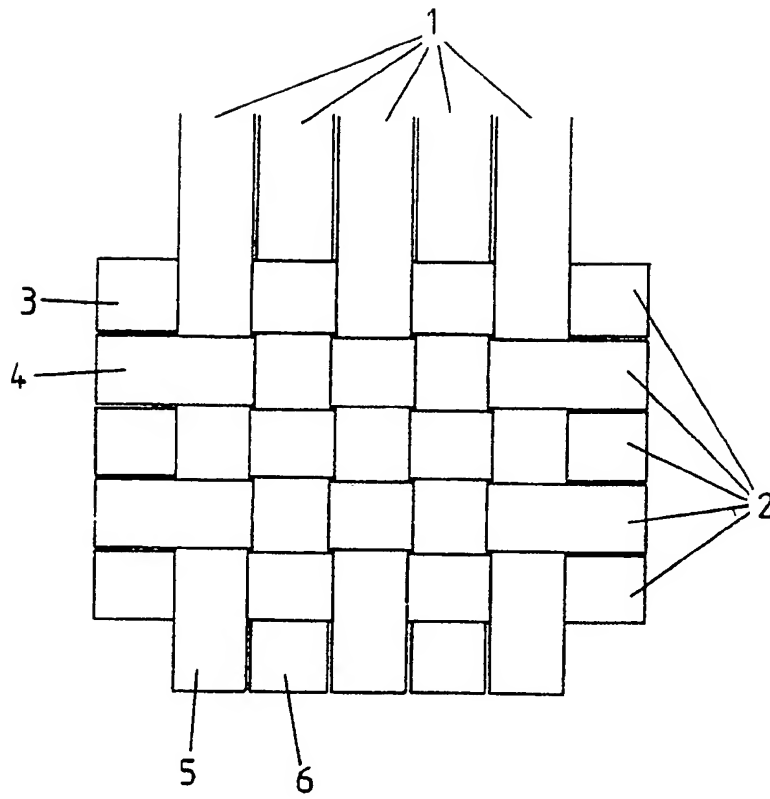


FIG. 1

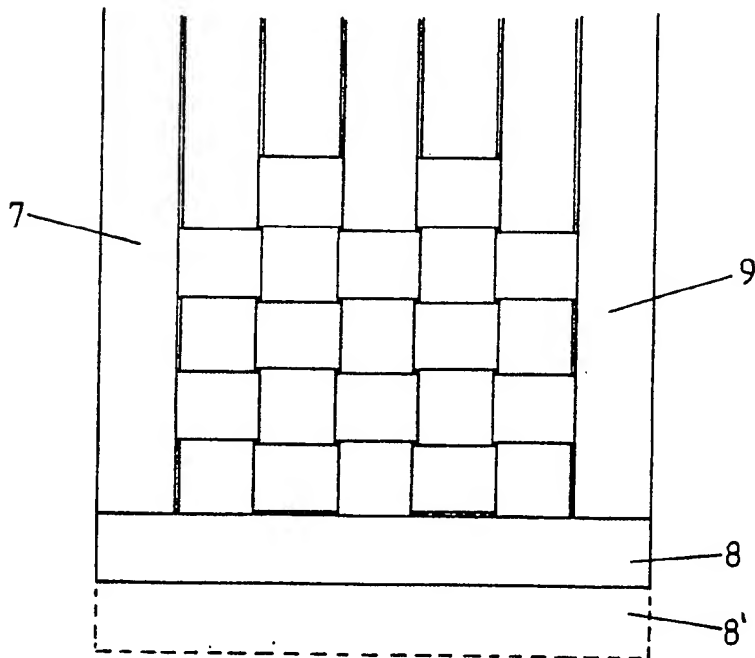
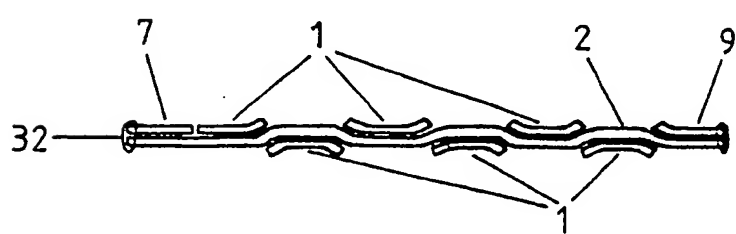
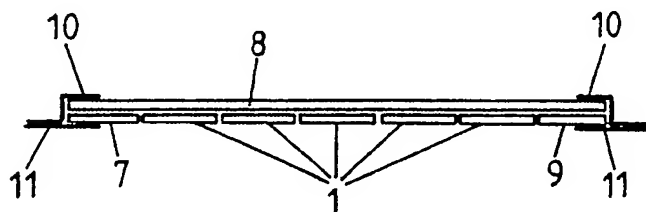
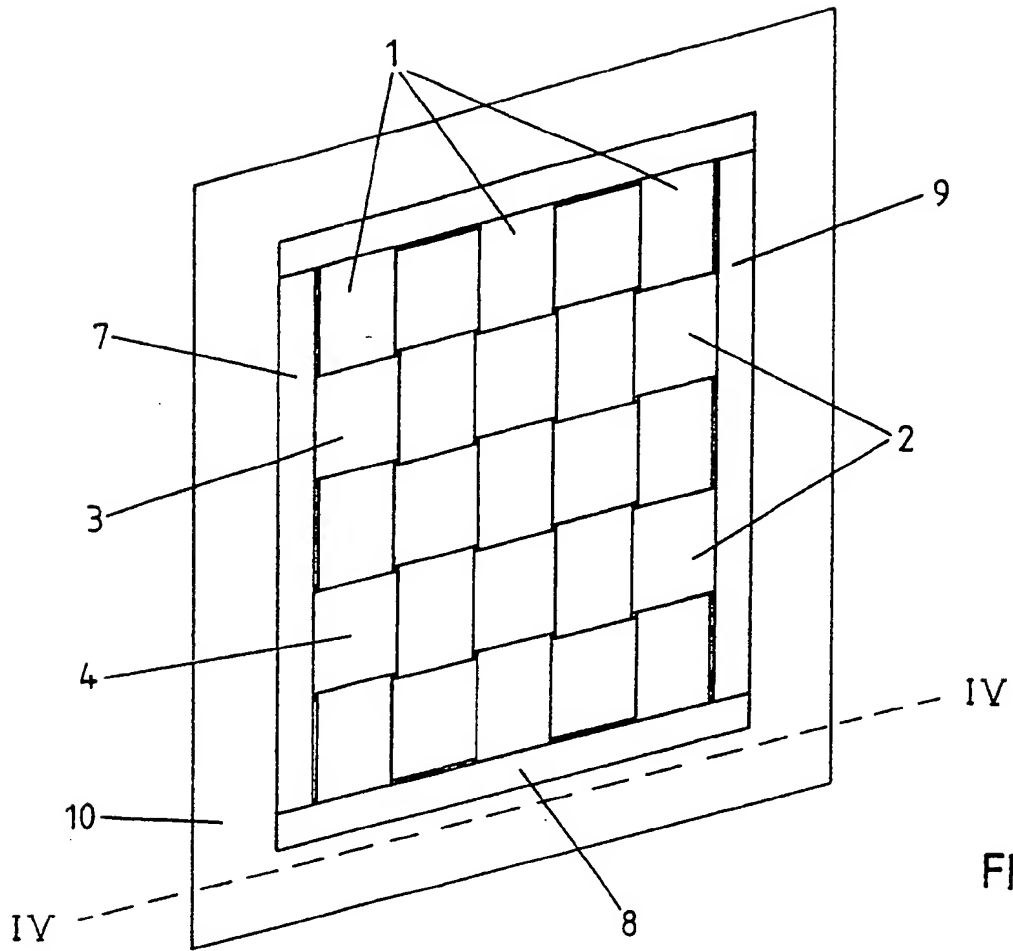


FIG. 2





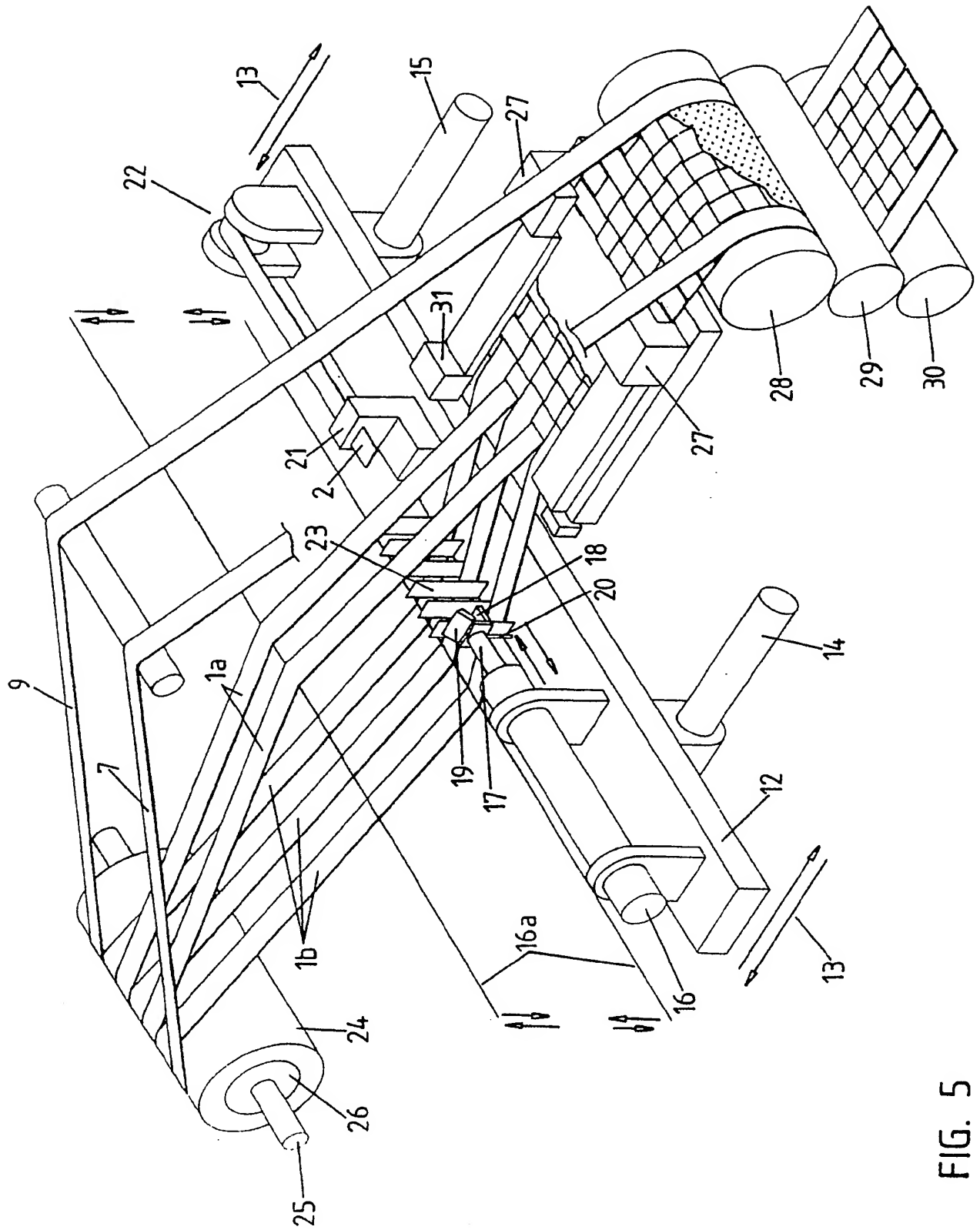


FIG. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-2 745 444 (KRAFT PAPER) * Claim 1; figures 1,2; column 2, lines 7-13 *	1-3,7-9	D 03 D 15/00 D 03 D 47/16
A	GB-A-1 176 078 (SAKAI) * Claim 1 *	1	
A	DE-A-2 615 046 (SPOHN) * Claims 1,5,6,11 *	1,4,7	
A	GB-A- 289 570 (GLEDHILL) * Claims 1-3 *	4	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D 03 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21-04-1988	Examiner CATTOIRE V.A.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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